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6. AUTHOR(S) J. Mike Dwyer					
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13. ABSTRACT (Maximum 200 words) This Performance Oriented Packaging (POP) test was conducted to ascertain whether the Shipping and Storage Pack for Mk 4 Mod 3 Practice Bomb Signal Cartridges meets the Packing Group II requirements specified by the Code of Federal Regulations, Title 49 CFR, Parts 107 through 178, dated 31 December 1991. The pack consists of 20 fiberboard inner packagings, each containing 25 cartridges, enclosed in a wood box outer pack. Aluminum cylinders (500 count) were used in place of the cartridges for test purposes. The packaged commodity used for the test weighed 28 kg (60 pounds). This represents the current maximum commodity weight. To compensate for future growth variations in commodity and/or packaging, 4 kg (10 pounds) were added. Gross weight of the loaded pack was 43 kg (94 pounds). The test results indicate that the pack has conformed to the POP requirements.					
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**PERFORMANCE ORIENTED PACKAGING TESTING
OF
PACK, SHIPPING AND STORAGE, FOR
MK 4 MOD 3 PRACTICE BOMB SIGNAL CARTRIDGES
FOR PACKING GROUP II SOLID HAZARDOUS MATERIALS**

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INTRODUCTION

This Performance Oriented Packaging (POP) test was performed to ascertain whether the Shipping and Storage Pack for the Mk 4 Mod 3 Practice Bomb Signal Cartridges meets the Packing Group II requirements specified by the Code of Federal Regulations, Title 49 CFR, Parts 107 through 178, dated 31 December 1991. The pack consists of 20 fiberboard inner packagings, each containing 25 cartridges, enclosed in a wood box outer pack. Aluminum cylinders (500 count) were used in place of the cartridges for test purposes. The packaged commodity used for the test weighed 28 kg (60 pounds). This represents the current maximum commodity weight. To compensate for future growth variations in commodity and/or packaging, 4 kg (10 pounds) were added. Gross weight of the loaded pack was 43 kg (94 pounds).

Due to unavailability of additional simulated signal cartridges (aluminum cylinders) only one pack was used for testing. This is less than the number required by the regulations. Approval for this deviation has been granted by the Under Secretary of Defense, Memorandum for the Joint Logistics Commanders dated 22 February 1990.

TESTS PERFORMED

1. Base Level Vibration Test

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.608. The pack was placed on a repetitive shock platform which has a vertical linear motion of 1-inch double amplitude. Movement of the pack was restricted during vibration in all but the vertical direction. The frequency of the platform was increased until the pack left the platform 1/16 of an inch at some instant during each cycle. Test time was 1 hour.

2. Stacking Test

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.606. The pack was subjected to a force applied to its top surface equivalent to the total weight of identical packages stacked to a minimum height of 3 meters (including the test pack). A weight of 384 kg (846 pounds) was stacked on the test pack. The test was performed for 24 hours. The weight was then removed and the pack examined.

3. Drop Test

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.603. Five drops were performed from a height of 1.2 meters (4 feet), impacting the following surfaces:

- a. Flat bottom.

- b. Flat top.
- c. Flat on long side.
- d. Flat on short side.
- e. One corner.

PASS/FAIL

1. Base Level Vibration Test

The criteria for passing the base level vibration test is outlined in Title 49 CFR, Sec. 178.608(c): No test sample should show any deterioration which could adversely affect transportation safety or any distortion liable to reduce packaging strength.

2. Stacking Test

The criteria for passing the stacking test is outlined in Title 49 CFR, Sec. 178.606(d): No test sample may show any deterioration which could adversely affect transportation safety or any distortion likely to reduce its strength, cause instability in stacks of packages, or cause damage to inner packagings likely to reduce safety in transportation.

3. Drop Test

The criteria for passing the drop test is outlined in Title 49 CFR, Sec. 178.603(f): A package is considered to successfully pass the drop tests if for each sample tested, no rupture occurs which would permit spillage of loose explosive substances or articles from the outer packaging.

TEST RESULTS

1. Base Level Vibration Test

Satisfactory.

2. Stacking Test

Satisfactory.

3. Drop Test

Satisfactory.

DISCUSSION

1. Base Level Vibration Test

The input vibration frequency was 3.5 Hz. Immediately after the vibration test was completed, the pack was removed from the platform, turned on its side and inspected. No unfavorable distortion or deterioration was observed.

2. Stacking Test

The pack was inspected after the 24-hour period was over. No unfavorable distortion or deterioration was observed.

3. Drop Test

After each drop, the pack was inspected. The contents were completely retained by the pack.

REFERENCE MATERIAL

A. Code of Federal Regulations, Title 49 CFR, Parts 107-178.

B. Bureau of Explosives Tariff No. BOE 6000K Hazardous Materials Regulations of the Department of Transportation by Air, Rail, Highway, Water including Specifications for Shipping Containers.

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TEST DATA SHEET

POP MARKING:	
UN 4C1/Y43/S/**/USA/DOD/NAD	
**YEAR LAST PACKED OR MANUFACTURED	
Nomenclature: Shipping and Storage Pack for Mk 4 Mod 3 Practice Bomb Signal Cartridges	
Type: 4C1	NSN: N/A
Drawing Number or P/N: 923AS504	Outer Packaging Material: Wood Box (MIL-B-2427, type I, C1.1, grade C)
Dimensions: 29.00" L x 12.00" W x 12.50" H	Gross Weight: 43 kg (94 pounds)
Closure (Method/Type): Two 5/8" steel straps and eight 7d nails	Tare Weight: 11 kg (24 pounds)
Additional Description: 25 cartridges are encased in a fiberboard inner packaging 20 fiberboard inner packagings are enclosed in the wood box outer pack	
PACKAGED COMMODITY:	
Name: See table 1	NSN(s): See table 1
United Nations Number: See table 1	
United Nations Packing Group: II	
Physical State (Solid, Liquid, or Gas): Solid	
Vapor Pressure (Liquids Only): N/A At 50 °C: N/A At 55 °C: N/A	
Consistency/Viscosity: N/A	Density/Specific Gravity: N/A
Amount per Package: See table 1	Flash Point: N/A
Net Weight: See table 1	
PACKAGED COMMODITY USED FOR TEST:	
Name: Aluminum cylinders (500 count)	Physical State: Solid
Consistency: N/A	Density/Specific Gravity: N/A
Test Pressure (Liquids Only): N/A	Net Weight: 32 kg (70 pounds)
Additional Description: The net weight includes the current maximum commodity weight plus an additional 4 kg (10 pounds).	

N/A = Not Applicable

TABLE 1
Commodities Approved for Shipping in the
Shipping and Storage Pack for
Mk 4 Mod 3 Practice Bomb Signal Cartridges

NALC/ DODIC	NSN	Commodity Nomenclature	Packing Drawing Number	Haz Class/Div	UN Number	Units/ Package	Total Net Weight (lb)	Total Gross Weight (lb)
F562	1325-00-038-4638	Cartridge, Signal, Bomb, Practice, Mk 4 Mod 3	30003- 398800	1.4G	0312	500	60	94